

FACTSHEET: Research fraud

Research fraud is publishing data or conclusions that were not generated by experiments or observations, but by invention or data manipulation. There are two kinds in research and scientific publishing:

- **Fabrication.** Making up research data and results, and recording or reporting them.¹
- **Falsification.** Manipulating research materials, images, data, equipment, or processes. Falsification includes changing or omitting data or results in such a way that the research is not accurately represented.¹ A person might falsify data to make it fit with the desired end result of a study.

Both fabrication and falsification are serious forms of misconduct because they result in a scientific record that does not accurately reflect observed truth.²

Certain instances of fraud can be easy to spot—for example if a referee knows for a fact that a particular laboratory does not have the facilities to conduct the research that was published. Or, if it's obvious an image looks manipulated or is made up from several different experiments. The data from the control experiments might be 'too perfect'. In such situations, an investigation would

be conducted to determine if an act of fraud was committed.³ Digital image enhancement is acceptable. However, a positive relationship between the original data and the resulting image must be maintained to avoid creating unrepresentative data or the loss of meaningful signals. If a figure has been significantly manipulated, you must note the nature of the enhancements in the figure legend or in the 'Materials and Methods' section.

What about unintentional error that comes across as misconduct? According to the U.S. Office of Research Integrity, research misconduct does not include honest error or differences of opinion.¹ But it's best never to have the integrity of your work come into question. As a researcher and author, it is essential to understand what constitutes appropriate data management (including data collection, retention, analysis and reporting) in accordance with responsible conduct of research.⁴

To help prevent fraud, most publishers have strict policies on manipulation of images and access to the reported data. It's a good idea to familiarize yourself with them before you submit a paper.

Some general guidelines (which may vary from field to field, publisher to publisher) include:⁵

Manipulation of images

- Images may be manipulated for improved clarity only.
- No specific feature within an image may be enhanced, obscured, moved, removed, or introduced.
- Adjustments of brightness, contrast, or color balance are usually acceptable as long as they do not obscure or eliminate any information present in the original.

Data access & retention

- Authors may be asked to provide the raw data in connection with a paper for editorial review. Therefore all data for a specific paper should be retained for a reasonable time after publication. There should be a named custodian for the data.
- Studies undertaken in human beings, e.g. clinical trials have specific guidelines about the duration of data retention.

Action	What is it?	Is it unethical?	What should you do?
Manipulating data	Intentionally modifying, changing, or omitting data.	Yes. Comprehensive guidelines on data management and ethical handling of digital images, can be found at The Office of Research Integrity. http://ori.hhs.gov/images/ddblock/data.pdf	<ul style="list-style-type: none">● Never tamper with or change data. Keep meticulous records of your data.● Records of raw data should be accessible in case an editor asks for them-even after your paper has been published.● Understand the publisher's policies on data before you submit a paper.
Manipulating data images	This can include research materials, processes, tables, or equipment.	Yes. Your manuscript may be rejected if the original data are not presented or misrepresented.	<ul style="list-style-type: none">● If you need to adjust an image to enhance clarity, make sure you know what is considered acceptable before submitting your paper.● Even if the image manipulations are considered acceptable, report it to the publication prior to submitting your paper.²● Review any data images used to support your paper against the original image data to make sure nothing has been altered.²

*When in doubt, always consult with your professor, advisor, or someone in a position of authority who can guide you to the right course of action.

References

1. Office of Research Integrity U.S. Department of Health and Human Services. Definition of Research Misconduct. Available at: ori.hhs.gov/definition-misconduct. Accessed on February 14, 2019.
2. Scott-Lichter D and the Editorial Policy Committee, Council of Science Editors. CSE's White Paper on Promoting Integrity in Scientific Journal Publications, 2012 Update. 3rd Revised Edition. Wheat Ridge, CO: 2012. Available at: councilscienceeditors.org/resource-library/editorial-policies/white-paper-on-publication-ethics/acknowledgments/. Accessed on February 14, 2019.
3. Elsevier. Publishing Ethics Policies: Duties for Authors. Available at: elsevier.com/publishingethics. Accessed on February 14, 2019.
4. Office of Research Integrity U.S. Department of Health and Human Services. Guidelines for Responsible Data Management in Scientific Research. Available at: ori.hhs.gov/images/ddblock/data.pdf. Accessed on February 14, 2019.
5. Rossner M, Yamada K. What's In a Picture: The Temptation of Image Manipulation Journal Cell Biology 2004. Available at: jcb.rupress.org/content/166/1/11. Accessed on February 14, 2019.